

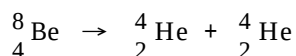
PHYSICS 6C PRACTICE QUIZ 10

THE FOLLOWING MULTIPLE CHOICE QUESTIONS ARE NOT TO BE TURNED IN FOR GRADING. THEY ARE INTENDED AS A SELF EVALUATION QUIZ AND PRACTICE FOR THE FINAL EXAM

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) A proton is projected at a stationary $^{226}_{88}\text{Ra}$ aluminum target. The proton momentarily comes to a halt at a distance from the center of an aluminum nucleus, equal to twice the nuclear radius. Assume that the nucleus retains its spherical shape and that the nuclear force on the proton is negligible. The initial kinetic energy of the proton, in MeV, is closest to:
- A) 17
 - B) 5.8
 - C) 8.7
 - D) 2.9
 - E) 13
- 2) Rubidium $^{87}_{37}\text{Rb}$ is a naturally occurring nuclide which undergoes beta-minus decay. The nuclide, which is the product of the decay, is:
- A) $^{88}_{37}\text{Rb}$
 - B) $^{87}_{38}\text{Sr}$
 - C) $^{87}_{36}\text{Sr}$
 - D) $^{87}_{38}\text{Kr}$
 - E) $^{87}_{36}\text{Kr}$
- 3) A radioactive nuclide of atomic number Z emits an alpha particle and the daughter nucleus then emits a beta-minus particle. What is the atomic number of the resulting nuclide?
- A) $Z-1$
 - B) $Z+1$
 - C) $Z-2$
 - D) $Z-3$

- 4) Carbon-14 has a half-life of 5730 years. A sample of wood has been recovered by an archaeologist. The sample is sent to a laboratory, where it is determined that the activity of the sample is 0.144 Bq / g. By comparing this activity with the activity of living organic matter, 0.230 Bq / g, the scientist determines how old the wood sample is, or more precisely, when the tree that the sample came from died. How old is the sample of wood?
- A) 2630 years
 - B) 4250 years
 - C) 3870 years
 - D) 2940 years
 - E) 4590 years
- 5) Polonium-216 decays to lead-212 by emitting what kind of nuclear radiation?
- A) Beta minus
 - B) Gamma
 - C) Beta plus
 - D) Alpha
 - E) X-rays.
- 6) A beryllium-8 atom at rest undergoes double alpha decay as follows:



The atomic masses are:

$${}^4_2\text{He} \quad 4.002603 \text{ amu}$$

$${}^8_4\text{Be} \quad 8.005305 \text{ amu}$$

The kinetic energy of each departing alpha particle, in keV, is closest to:

- A) 46
 - B) 65
 - C) 92
 - D) 130
 - E) 180
- 7) What is the minimum uncertainty in determining the position of an electron if the speed of the electron is 6000 m / s within an accuracy of 0.004%?
- A) 0.105 mm
 - B) 0.153 mm
 - C) 0.241 mm
 - D) 0.335 mm
 - E) 0.483 mm

- 8) A molecule of roughly spherical shape has a mass of 1.80×10^{-25} kg and a diameter of 0.6 nm. The uncertainty in the measured position of the molecule is equal to the molecular diameter. The minimum speed of the molecule is closest to:
- A) 1 m/s
 - B) 10 m/s
 - C) 100 m/s
 - D) 0.1 m/s
 - E) 0.01 m/s